DOCUMENT RESUME

ED 108 954 SE 019 331

TITLE	Science Education Newsletter No. 26.
INSTITUTION	British Council, London (England). Science Dept.
PUB DATE	Jan 75
NOTE	37p.
EDRS PRICE	MF-$0.76 HC-$1.95 PLUS POSTAGE
DESCRIPTORS	Curriculum; *General Education; Higher Education; *International Education; *Mathematics Education; *Newsletters; Program Descriptions; Publications; *Science Education
IDENTIFIERS	*Great Britain

ABSTRACT

This newsletter briefly describes present activities, projects, and publications in the areas of science education, mathematics education, and general education in Great Britain. Short articles on activities in Europe, Vancouver (Canada) and Tokyo are included along with descriptions of overseas activities in Germany, Nigeria and Singapore. (Author/EB)

****
* Documents acquired by ERIC include many informal unpublished *
* materials not available from other sources. ERIC makes every effort *
* to obtain the best copy available. nevertheless, items of marginal *
* reproducibility are often enccuntered and this affects the quality *
* of the microfiche and hardcopy reproductions ERIC makes available *
* via the ERIC Document Reproduction Service (EDRS). EDRS is not *
* responsible for the quality of the original document. Reproductions *
* supplied by EDRS are the best that can be made from the original. *
****

ED108954

THE BRITISH COUNCIL

U.S. DEPARTMENT OF HEALTH, EDUCATION & WELFARE
NATIONAL INSTITUTE OF EDUCATION
THIS DOCUMENT HAS BEEN REPRODUCED EXACTLY AS RECEIVED FROM THE PERSON OR ORGANIZATION ORIGINATING IT. POINTS OF VIEW OR OPINIONS STATED DO NOT NECESSARILY REPRESENT OFFICIAL NATIONAL INSTITUTE OF EDUCATION POSITION OR POLICY

Science Education Newsletter

Number 26 January 1975

Issued by

Education and Science Division

SE 019 331

Issued by:-
Educational Information and Research Department
for Educational Projects Department
The British Council
10 Spring Gardens
London SW1A 2BN

SEN No 26

CONTENTS

Editorial

ACTIVITIES IN BRITAIN - SCIENCE

1. University of Keele - MSc in Biological Education
2. University of Reading - MSc in Physics Education
3. Independent Learning in Science
4. Scottish Centre for Science, Mathematics and Technical Education
5. Association for Science Education - Annual Meeting
6. Science 5/13 Project
7. Schools Council Integrated Science Project

ACTIVITIES IN BRITAIN - MATHEMATICS

8. Scottish Modular Mathematics
9. Nuffield Mathematics Project
10. Gloucestershire Mathematics Workcards
11. Computer Appreciation for the Majority - NCC
12. Computer Book List for Schools
13. Computers in the Curriculum - Project Papers

ACTIVITIES IN BRITAIN - GENERAL

14. Concepts in Secondary School Mathematics and Science Project
15. Thomas Huxley College - new Diploma
16. Conservation Education Project
17. University of Wales: Environmental Education Diploma
18. "Living with Technology" Symposium
19. Project Technology
20. Schools Council Project Profiles and Index
21. School Geography in the Changing Curriculum - DES Survey No 19

22. PUBLICATIONS

OVERSEAS ACTIVITIES

23. Germany

24. Nigeria

25. Singapore

INTERNATIONAL ACTIVITIES

26. Chemical Education in Europe Project

27. British Council Course: Processes of Science Curriculum Development

28. Commonwealth Association of Science and Mathematics Educators

29. ICMI Symposium - Evaluation of Modern Mathematics Curricula - Vancouver

30. International Mathematical Union - General Assembly 1974

31. "Interactions between Linguistics and Mathematical Education" - Nairobi Symposium

32. ICMI-IDM Symposium - The Teaching of Geometry - Bielefeld

33. ICMI-JSME Regional Conference - Tokyo

34. Forthcoming International Conferences

Editorial

Future editions of Science Education Newsletter will appear at the end of January, May and September. There will therefore be the normal 4-month period between issues but this particular Newsletter will reach you after a 5-month gap.

Errata:-

In SEN 25.3 - the second line should read "the Schools Council Integrated Science Project and the Nuffield Secondary Science Project".

ACTIVITIES IN BRITAIN - SCIENCE

1. MSc in Biological Education - University of Keele

The one-year full-time course leading to the MSc (Education) at the University of Keele (SEN 22) has recently been extended to include the opportunity to specialise in Biological Education. This option will be available to students beginning in the next academic year as from October 1975.

Further information about the course is available from the Registrar, University of Keele, Newcastle, Staffordshire ST5 5BG.

2. Masters Degree in Physics and Education - Reading University

The University of Reading School of Education are establishing an MSc as a one-year full-time course in Physics and Education which will be parallel to the existing MSc course in Chemical Education. (See SEN 21.10).

Candidates for this course, which begins in October 1975, should hold a university degree in physics and have had at least 5 years experience in the teaching of physics. They should also hold the Diploma in Science Education of the University of Reading or an approved equivalent qualification.

The course is designed for those educationists who have or will have responsibility for the development, planning and teaching of physics courses up to university entrance level and who wish to extend their knowledge of physics within the context of education and curriculum change.

The areas of study are as follows:

1. Physics - Study of materials including structure, mechanical and electrical properties. Some current topics in physics, such as high energy physics, plasma physics, modern electronics and lasers.

2. Physics Education - Approaches to physics teaching for advanced pupils including the organisation and sequencing of physics courses, assignment and project work, course analysis and laboratory management. A discussion of the more difficult topics of school physics such as elementary quantum theory, diffraction, electro-magnetism etc.

3. Science Education - The structure of science courses with reference to the nature of scientific enquiry and of the learner. Evaluation in science education. Examining in science. Comparative science education.

Further information about the course and application procedure can be obtained from Mr N Lanham, School of Education, University of Reading, London Road, Reading RG1 5AQ, Berkshire, England.

3. "Independent Learning in Science"

This is the name chosen by a group of teachers in Britain, coordinated by Eric L Green, who are concerned with exchanging information in the field of individualised learning in science.

The membership of the group has now reached 330 and its duplicated newsletter, edited by Mr R E I Newton of Rugby School, is in its fourth issue, appearing 3 times per year. Membership costs £1 per year and in addition to the newsletter, members of the group receive a directory of members and a catalogue of materials produced by members. The group does not itself act as a clearing house and a member who sees something of interest in the catalogue of materials writes direct to the member who has produced it.

Further information may be obtained from Mr J Shapland, Countesthorpe College, Winchester Road, Countesthorpe, Leicester LE8 3PR.

4. Scottish Centre for Science, Mathematics and Technical Education
(See SEN 23.15, 23.18.11, 25.16)

The Centre has published two more in its series of memoranda, as follows:

Memorandum No 16: "Practical Work in Sixth Form Chemistry", price £0.20

Memorandum No 17: "Optics and Spectra: Models of the Atom", price £0.25.

Memorandum No 17 covers Sections P and Q of the Scottish Higher Grade Physics Syllabus. Section P includes geometrical optics, with the emphasis on direct methods of experimenting whenever possible, and the nature of light including two crucial experiments: Young's Interference Experiment; and the zinc plate and ultra violet light experiment fundamental to the photoelectric effect. Section Q shows how various aspects of physics previously studied shed light on the structure and mechanics of the atom, various threads from earlier work being drawn together but leaving the section basically open-ended.

These memoranda can be obtained from the Scottish Centre for Mathematics, Science and Technical Education, College of Education, Park Place, Dundee DDL 4HP, Scotland. Cheques and postal orders should be made payable to Dundee College of Education.

5. Annual Meeting of the Association for Science Education, Durham
31 December 1974 - 2 January 1975

This Meeting was as successful, well attended and enjoyable as its predecessors. Over 1000 participants (including almost 100 overseas visitors) enjoyed the bonus of the extremely pleasant setting of an exquisite cathedral city and the opportunity to visit historic buildings such as Durham Castle which is a flourishing part of the University.

Following recent trends, the Meeting tended towards more lectures and discussion on the teaching of science as opposed to those of science itself, and the format continued last year's experiment of combining lectures with one-day or half-day symposia. The themes of the latter were:

i. Considerations of a Common System of Examining at 16+
ii. Engineering Science at A-Level
iii. Science in the Earlier Years
iv. Science Teacher Associations and Educational Development (overseas)
v. Science in the Sixth Form of the Future
vi. The Royal Society Research in Schools Programme
vii. Examination Forum
viii. Environmental Education Curriculum.

The Overseas Symposium (iv. above) was organised by the British Council and divided into 4 sessions. Dr G Zarour (The Lebanon) and Professor H J Arnikar (India) contributed to the first session on 'The Development of Professionalism in Science', and Mr E Apea (Ghana) and Mr B Young (Britain) considered 'The role

of professional associations in curriculum change' during the second. After lunch representatives from UNESCO, VSO and The British Council spoke of 'The role of Support Agencies for science teaching overseas' and the final session considered 'Cooperation between professional associations and agencies' with particular reference to the International Committee of Associations for Science Education (ICASE).

As usual an exhibition of overseas materials was held throughout the Meeting with the theme 'Science Teacher Associations' providing background for the symposium. Details of membership, constitution, journals and other publications were received from Associations in 18 different countries and it was interesting to note the inclusion of a strong European contribution this year.

Other parts of the programme included lectures, a presidential address by Sir Dermot Christopherson on 'Models and analogues in design and communication' and the Macmillan Education Lecture given by the Bishop of Durham on the topic of 'Science and moral education'. There was the usual members exhibition and displays by manufacturers and publishers which ensured that all latest developments were available for perusal, experimentation and discussion.

The ASE have again decided to issue a report of the Annual Meeting and it is intended that this should form the fourth in the ASE Study Series of publications. The report will include a synopsis of major lectures, reports of symposia and discussions, the Macmillan Education Lecture and a selection of member contributed papers. It should be some 50 pages in length and will be available in late March, price 45 pence. Applications should be made to The Publications Officer, ASE, College Lane, Hatfield, Herts.

6. Science 5/13 (SEN 19.3)

The three most recent publications in the series produced by the Science 5/13 Project are:-

1. Vol 2 Part 2. Investigations - This book has 3 chapters concerned with various ways of helping children to become more aware of the dynamic nature of their surroundings - using weather changes, plant and animal changes and landscape changes. The remaining 3 chapters explore the child's local environment of the playground and bird observation as a basis for developing expression and writing skills.

2. Vol 3 Part 1. Tackling Problems has an excellent first chapter outlining the background of tackling problems followed by chapters on some major biological ideas and relationships approached through the design of controlled experiments. Areas covered include relationships between form and function in parts of plants, in animals and between plants and animals. A final chapter considers variation and adaptation.

3. Vol 3 Part 2. Tackling Problems deals with experiences through which children can become aware of the uneven way in which plants and animals are distributed. A consideration of investigation procedures and sampling is followed by a look at a wide variety of environmental factors.

7. Schools Council Integrated Science Project - Patterns 3
(see SEN 12.4, 13.4, 14.3, 19.1, 19.2, 23.2)

The most recent issues of the SCISP series "Patterns" have been:-

Technicians' Manual 2 - the complementary Manual to "Patterns 2 - Interactions and building blocks". This follows a similar format to Technicians' Manual 1 and includes preparation guides, equipment lists, details of materials, lists of suppliers, books and other reading aids.

Patterns 3 - Energy - Pupils' Manual - succeeds Patterns 1 and 2 which considered a variety of building blocks and patterns of interaction between these. This third manual considers energy under the main headings of "Transferring energy, energy and particle interactions, energy and electricity, sources of energy and using energy efficiently". It is designed to cover approximately 2½ terms' work.

Topic Book - Weather Patterns and

Topic Book - The Electrification of British Rail

Both these Topic Books are designed to accompany "Patterns 3".

Technicians' Manual 3 - outlines all details necessary for the preparation of work for "Patterns 3".

Patterns 4 - Interaction and Change - Pupils' Manual - considers changes in behaviour, acidity, motion, the Earth, organisms, atoms, molecules, populations and communities, environment and society. Each topic is looked at in detail and explanations for the changes sought.

Top Book - Human Behaviour - accompanies "Patterns 4"

8. Scottish Modular Mathematics (See SEN 24. 11.2)

Modules 1-18 of the Modular Mathematics materials have now been published by Heinemann Educational Books Ltd. The modules, which were prepared by members of the Scottish Mathematics Committee, provide an individualised learning approach based upon workcards and worksheets for use with mixed ability classes around the age of 12 years.

The present cost of adopting a single module out of the 18 will be:

Workcards	£6.50
Worksheet Masters	£4.00
Apparatus	£4.00
	£14.50

(NB: Workcards and apparatus once purchased are not expendable items).

In addition, a Teacher's Pack is available containing one copy of every workcard, worksheet, an example book, teacher's notes and answers. Priced £15.00 for Modules 1-18 inclusive.

Further information may be obtained from Mr Graham Taylor, Heinemann Educational Books Ltd, 48 Charles Street, London W1X 8AH.

9. Nuffield Mathematics Project (See SEN 19.10)

Descriptive literature about the books so far published in the Nuffield Mathematics Project series has inevitably tended to concentrate on new titles as they appeared. With the final titles due to appear in 1974 and 1975, however, Chambers/Murray have recently published an information pamphlet outlining all the publications so that those concerned in the teaching of mathematics can review the Project as a whole. The publishers note that since the revision, over a million copies of the English language edition have been sold and that Italian, Dutch, French and German editions of some titles have also been published. Others are currently in preparation.

The following are briefly described together with sample pages and cards:

Introductory Guides

Main Teachers Guides - Computation and Structure
- Graphs Leading to Algebra
- Shape and Size

Weaving Guides
Check-up Guides
Problems
Modules
Parents Guide
Nuffield/CEDO Handbooks

All these are summarised in a useful table illustrating at a glance the appropriate age range covered by the various units.

This pamphlet should form a useful summary of the available material for anyone interested in purchasing any of the titles. Copies may be obtained from W & R Chambers, 11 Thistle Street, Edinburgh, EH2 1DG, free of charge.

10. "Outset" - Gloucestershire Mathematics Workcards
Macmillan Price: £6.20 a box of 180 cards

A set of 180 mathematics workcards for use in infant schools entitled "Outset" has been produced at the Filton Teachers' Centre by a group of teachers in conjunction with Gloucestershire County Advisory Staff.

The aim of these cards is to provide a structured approach to basic mathematical concepts by taking a much broader view than is usual of sorting and ordering activities. It is not intended that the cards should cover all aspects of infant mathematics but rather to provide additional experiences for young children. A minimum of language is used and many words are repeated on several cards. This, together with attractive coloured illustrations and use of a "hardwearing" material make the cards ideal for use with infants.

The workcards are divided into sets according to topic. These, briefly, are sorting by colour, size, shape, length, weight and capacity, sorting coins and final miscellaneous assignments. It is intended that accompanying equipment should be used throughout these assignments such as buttons, beads, blocks etc and can either be gathered by the teacher or be obtained ready-made in the "Outset Sorting Box" from Kabi Limited, Cranborne Road, Potters Bar, Herts.

After specific sorting activities a further set of the cards deal with the development of number concepts such as "more" and "less", matching and one to one correspondence, cardinal numbers, counting, addition facts and the beginnings of multiplication and division.

The cards are accompanied by a small Teacher's Notebook outlining the equipment needed for use with each set and brief outlines of the concepts and aims behind each assignment.

Further details may be obtained from Macmillan & Company, Little Essex Street, London WC2.

11. "Computer Appreciation for the Majority" - Guidelines Materials from the National Computing Centre

The National Computing Centre Limited is a non-profit organisation financed by industry, commerce and government (see SEN 19.11). Since its establishment, work has developed in a number of areas - the result of which has been the publication of guideline materials for teachers entitled "Computer Appreciation for the Majority". The materials consist of a Teacher's Guide in ring-binder format and a most useful accompanying book of spirit duplicating masters to be used to provide class handouts.

The initial concept of the guidelines arose at a time when the raising of the school leaving age provided teachers with an opportunity to explore new areas. The aim was to help young people to understand the place of the computer in the society and to attempt to remove the mystery and popular misconceptions often associated with its use. Designed to last between 30 and 50 hours, the materials are intended for use with 15/16 year old pupils in the lower half of the ability range. It was also decided that it would be inappropriate to produce guidelines which would be of use only to a mathematics or science teacher and they are therefore written for teachers of any subject background.

As a result of experience during trials, the authors recommend that the appreciation course is presented through the practical effects of the applications of computers rather than as a final consequence of a progressive study. Thus, although a small amount of practical programming work using BASIC language is suggested, it is not intended that this should form the focus of the course. (A large amount of practical programming was found to be a distraction rather than an enhancement).

The source materials contained in the Teacher's Guide are divided into sections as follows:

1. Introduction, Discussion, and Demonstration - ideas for first lessons and a teacher demonstration programme.

2. Principal Components of a Computer - contains clear descriptions and explanations accompanied by excellent drawings.

3. Computer Applications

4. Data Processing - defines terms and discusses data processing systems

5. Case Studies - using an electricity ... ling system and a local health
& 6. authority records system

7. Manual Information Processing - puts computers into an historical perspective

8. Flowcharting

9. Programming

10. A model Computer

11. Two more Case Studies - a supermarket and an airline seat enquiry and reservation system

12. Social Implications of Computing.

13. Further Ideas

14. Resources - including lists and sources of books, films, slides etc.

Useful reference lists are given at the end of each section, and a final Appendix contains teacher demonstration programmes.

The booklet of spirit duplicator masters provides handouts of drawings, diagrams, worksheets and summaries to accompany sections 2, 3, 4, 6, 8, 9, 10 and 11 of the Teacher's Guide.

Further information may be obtained from the NCC, Quay House, Quay Street, Manchester M3 3HU. Copies of the book of spirit duplicator masters may be obtained from NCC Publications, David & Charles (Holdings) Limited, South Devon House, Railway Station, Newton Abbot, Devon.

12. Computer Book List for Schools

The recent increase in interest in computer education has resulted in the publication of a very large number of books on various aspects of computing and at a variety of levels. The Schools Committee of the British Computer Society (see SEN 15.9) has therefore produced a book list with the hope of enabling teachers to focus on those which are likely to be of practical value in their work. A first book list was originally published in 1969 and subsequently revised in 1973 but this new version completely overhauls the previous list and every book is recommended from experience by members of the Committee. This criterion has meant that books published during the last 12 months could not be included because experience of using the book could not be gained.

The book list is divided into two sections - a First List and a Main List. The former contains books which, it is felt, should be the first buy for any school or college introducing computer studies into the curriculum. In both

sections books are arranged alphabetically by author with publication and price details, together with comments indicating ability and age levels or the suitability for particular examination purposes. A brief classification has been tabulated under the following headings:-

General - giving a broad spectrum of computers and computing

Applications

Programming

Languages

Computer Education

Data Processing

Implications

Hardware and Circuitry

The choice of books to be included has been determined by the Schools Committee as a whole with the comments on each book and the classification being the responsibility of the members of the Working Party. The list should provide an invaluable aid to those interested in beginning or extending any form of computer education.

Copies may be obtained by sending a 220 x 108 mm envelope with sender's name and address, plus second class postage, to the Education Department, British Computer Society, 29 Portland Place, London W1N 4AP.

13. Computers in the Curriculum - Schools Council Project Papers 7/8/9

There have been three recent additions to the series of Project Papers issued by the "Computers in the Curriculum" project. (See SEN 23.14).

Project Paper 7 briefly outlined progress on the project and gives a brief resume of the first year's work.

Project Paper 8 is based on Project Paper 4 and considers the requirements for computer documentation for nationally available computer based materials.

Project Paper 9 is entitled "Computers and Economics Education" and attempts to outline the work already in existence at various educational levels. The authors examine the present pattern of use, the nature of economics and the areas in which computer packages would be appropriate, and possible future developments. The final section looks at economic models.

Further information about the project and copies of the Project Papers may be obtained from the headquarters at Chelsea College, Centre for Science Education, Bridges Place, London SW6 4HR.

14. Concepts in Secondary School Mathematics and Science Project

A new project entitled "Concepts in Secondary School Mathematics and Science Project" has recently been set up at the Centre for Science Education, Chelsea College, University of London. A team of research fellows will be undertaking a 5-year exercise funded by the SSRC, with the overall aim of identifying which mathematical and scientific concepts secondary school children of differing ages and abilities are able successfully to master, and in what order.

The necessity for such work is evident after a decade or more of curriculum development in these two subjects which has produced a number of worthwhile, and often inspired, courses. While materials were produced on an experimental basis, they were often written by imaginative teachers whose experience was based on children of well above average motivation and ability. It was almost inevitable therefore that there would prove to have been some mismatches between the content and approaches introduced, and the capabilities of the children with whom the courses were then used during large scale adoption.

The tendency for children in the early secondary school to be taught in mixed ability groups has also exacerbated the need for this fundamental research. The range of conceptual levels of different children at this stage is enormous, with some 11 year olds functioning conceptually as average 7 year olds and others as average 15 year olds, in the same class. The curriculum implications of this mode of organisation are still being worked out, but commonly work is set on an individual basis. The problem is to produce a bank of materials graded according to difficulty and, since mathematics and science are to some extent hierarchical subjects, arranged in some sort of partially ordered network. The child can then be assigned a suitable task on the basis of his conceptual level and the assignments he has previously completed.

There is of course a great deal of informal experience among teachers with insight and experience about the kinds of work that are suitable for particular children, but this needs to be systematically collected and extended on a more structured basis.

The end product of the study therefore is planned first of all to be a number of tested techniques whereby class teachers can estimate the conceptual level at which individuals in their classes are operating. Part of these will use mathematical material, and part scientific.

Secondly, methods will be formulated of estimating the conceptual difficulty of mathematical and scientific learning steps which the teacher is proposing to use, and trees of possible learning hierarchies will be published after extensive testing on pupils of different ages and abilities. Perhaps the keynote of the Chelsea study will be that of leaving it to the teacher to know best how to use its materials, rather than dictating curricula to him.

It is thus one of the tasks of the team to perform an analysis of secondary mathematics and science in terms of intellectual demand. In doing this it is planned to use a framework and methodology which is roughly Piagetian. In the physical sciences in particular the work of Piaget and others provides a reasonable starting point for an analysis. However, for mathematics and much of biological science it seems likely that the theoretical basis for adolescent thought provided by the Geneva school will need to be extended. It is hoped along the way to throw some light on the relationship between mathematics and science both generally and within the secondary school.

Although much work will be on an individual basis with different children it is also planned to modify conceptual tests so that they are capable of being used with a larger group, and, in both cases, by the usual class teacher. The teacher will be able, on the basis of the results of such informal 'tests', to match the pupils to suitable assignments or course materials.

One of the first activities of the project has been to embark on a large scale, but in overall terms rather more crude, exercise to get some picture of the percentages of children at each conceptual level in each of the age groups between 9 and 13. This will give a basis for future work in curriculum development.

Further information on the project may be obtained from Mrs M Brown, or Mr M Shayer, Centre for Science Education, Chelsea College, University of London, 88-90 Lillie Road, London SW6 7SR.

15. Diploma in Science and Mathematics for Education in the Middle Years of Schooling 8-13 - Thomas Huxley College, London

Thomas Huxley College was established as a constituent College of the London University Institute of Education in 1967 to provide courses for non-residential older students. The content and approach of all courses attempt to take account of the special needs of adults and the College is a particularly suitable centre for courses for experienced teachers.

The one-year diploma course in Science and Mathematics for Education in the Middle Years of Schooling 8-13 is awarded by the University of London after one year of full-time study. Participants may be practising teachers from primary, middle or secondary schools and are expected to have had substantial experience (at least 5 years) in the teaching of science, mathematics or related fields such as geography, craft or home economics. The chief aims are:

a. to give teachers the opportunity to refresh and extend their own knowledge of science and mathematics;

b. to enable them to study the most recent changes in teaching these subjects and to review the part they play in the school curriculum. Particular consideration will be given to the problems of integration of subjects.

c. to develop the contribution which the teachers will make to, and the responsibilities they may accept in, the teaching of science and mathematics in schools at their various levels.

The plan of the course covers 4 main areas - Science, Mathematics, Integration of Studies and Group Membership. Each teacher will cover the entire field but his course will be individually determined under tutorial guidance according to his qualifications, experience and interests.

The Science Section will look at all the major recent curriculum development projects and, in addition, advice and practice will be given in the organisation of resource and teaching areas in experimental, demonstration and fieldwork techniques. The use of tools and the provision of science materials and safety precautions will also be considered.

The Mathematics Section will similarly review curriculum projects and relate these to organisation for individual, group or class teaching. The place of measurement and calculation in science, the application of mathematics to other subjects and method of assessments of pupils work will be considered.

The Integration Section will attempt to bring together the separate disciplines where appropriate. Two main lines of approach will be adopted:

a. select fields for science where science is a suitable starting point and mathematical activities are relevant, eg the classification of plants and animals - Venn diagrams and sets;

b. select mathematical topics as suitable starting points to suit the age group and to choose science topics where these processes will naturally occur, eg elementary statistics - the recording and plotting of experimental results.

The Group Membership Section will aim to develop particular skills and qualities required of teachers in the areas of decision making and management. Special consideration will be given to curriculum planning and the setting of objectives, the design of learning systems and the construction of learning experiences, and the evaluation of learning outcomes. The position of the teacher as manager in the deployment of learning resources, teaching aids and non-teaching personnel will further be considered together with his position as a member of a team with shared responsibility in setting objectives, determining content and evaluating outcome.

The course is based upon a programme of lectures, seminars and discussions supplemented by outside visits, demonstrations and lessons, group and individual practical work, and independent investigation. Assessment is based partly upon course work, two examination papers and a special study to be presented in the form of a 'Report' of about 10,000 words. The latter may be presented one year afterwards and should be based upon the teacher's own work in a school giving evidence of the use of aspects of the course.

The course is not specifically designed for overseas students but a few have already been accepted during 1973/74 and it is hoped to extend this number in the future. Further particulars and application forms may be obtained from the Principal, Thomas Huxley College, Woodlands Avenue, Acton, London W3 9DP.

16. "People and Resources" - Conservation Education Project

"People and Resources" is a new series for secondary schools which has been developed by the Conservation Education Project, Centre for Science Education, Chelsea College, University of London. A team of authors headed by Professor P Kelly and Mr J Barker have been sponsored by Esso Petroleum Company as part of its contribution to European Conservation Year.

The series, which will be published in February 1975, consists of three Students Books and a Teachers Guide. These are briefly as follows:

1. Students Books

"Breathing Space" - This covers aspects connected with air. Topics included are use of air, pollution and its effects, and present and future policies for conservation.

"Think or Swim?" - This covers aspects of water and topics again include usage, pollution and conservation.

"In the Balance" - Is the third in the series and deals with problems related to food, population and people, the use and re-use of materials and energy resources.

Teachers Guide - This is in three main sections - one for each Students Book. Each section deals with the content of the relevant Students Book chapter by chapter and includes bibliography, details of more specialised materials and a guide to sources of visual aids and useful addresses. The aims of the series are also outlined with suggestions for further work and development beyond the text content.

In selecting and developing the content of the series the authors had two major aims in mind:

a. To provide information and experiences by which students gain an appreciation of some of the diverse ways in which people both affect and are affected by the use of natural resources.

b. To provide experiences of both the science and art of making decisions concerned with the balance between environmental exploitation and human needs.

In order to achieve these aims a number of key principles have been adopted which are considered applicable to any topic in addition to an analysis of the mental abilities and attitudes which it seemed important to cultivate in order to heighten a student's facility for judgement. The principles include:

a. That there is a variety of resources available in the environment.

b. That resources have characteristics which affect their availability.

c. That the exploitation of one resource can affect other resources.

d. That the exploitation of resources can influence the evolution of many species and particularly the physical and cultural evolution of human beings.

e. That the prime feature of the human species is not how well it is adapted to any particular environment but how well it adapts many environments to meet its needs.

f. That we adapt the environment to a variety of technologies.

g. That people have a wide range of needs which relate to their use resources.

h. That the form and function of human societies influence the use of resources.

i. That beyond the basic needs for survival, human demands on resources are relative.

j. That within a human population people will vary in their needs and hence their requirements from natural resources.

The contents of the books represents an attempt to translate theoretical ideas into realistic educational experiences of students and to distinguish between emotional reaction and practical realities in any given situation. The topic moves broadly from activity and experiences at a local and individual level towards a wider outlook at national and world level. The content of the books is of three kinds:

a. A minimum of descriptive text combined with a large number of excellent illustrations.

b. Practical work with ideas for investigations and surveys.

c. Problem involving a variety of statistical, illustrative and documentary material presented in an unbiased manner.

"People and Resources" does not aim to provide a specific course of its own but is a collection of materials to be used within established school subjects or as interdisciplinary links between them. The books can be used in any order and for a wide age range. During trials it was found that various aspects of materials could be used with equal success for second to fifth formers and could be used as a most useful basis to a Mode 3 CSE course.

It is emphasised throughout the series that the importance lies in the effect on the behaviour of students. The issues dealt with will relate to home, school and local community in the first instance and thus it is hoped to remove the 'academic abstraction' of this increasingly important area.

Further information may be obtained from the publishers - Evans Brothers Limited, Montague House, Russell Square, London WC1B. The students guides are available price 95p each and the teachers guide at £2.95.

17. Caerleon College of Education, Newport, Gwent, Wales:
University of Wales Diploma in Environmental Education

This one-year full-time "Learning Through the Environment" course commencing September 1975, is intended for qualified teachers with teaching experience in primary, middle or lower secondary schools. It is anticipated that the course, including practical activities, will be suitable for teachers and advisory staff from Britain and overseas who have an appreciation of the significance of environmental education in the school curriculum. Production of resource material relevant to the home area of the student will be one of the course objectives.

The course aims to consolidate and further develop the concepts and practical ideas embodied in the Schools Council Project "Environmental Studies 5-13" and other relevant curriculum studies. The course's scheme of study covers the structure and concepts of environmental education, techniques of learning and teaching, the potential of the school environment, teaching resources, the organisation of Environmental Studies, planning and the environment and practical work.

18. Symposium: "Living with Technology"

This 3-day symposium was organised by the Standing Conference on Schools' Science and Technology and took place in Sheffield in September 1973. It considered the nature of the environment surrounding modern education in science and technology in schools and the consequences for the development of such education in the future. The symposium's business was divided into three sessions covering the trends in the responses to and the implications of changes in technology. Each session included keynote addresses by principal speakers and these were followed by discussion seminars for which the 130 participants were allocated to seminar groups.

The report of the symposium has now been published: it contains digests of the talks by the principal speakers together with a summary of the findings of the discussion groups. It is obtainable, price £0.30 (cash with order, cheques and postal orders payable to "Trent Polytechnic") from: The National Centre for School Technology, Trent Polytechnic, Burton Street, Nottingham NG1 4BU.

19. Project Technology Handbook No 13 - "Basic Electrical and Electronics Construction Methods" - Heinemann Educational Books and The Schools Council Price £0.80

This is the latest in the series of Project Technology Handbooks and covers the practical rather than the theoretical aspects of its subject, beginning with the

interpretation of electronic circuit diagrams and continuing through construction methods and electronic components (including integrated circuits) to electrical wiring and mechanical components such as motors and solenoids. The handbook ends with a section on the techniques of using hand tools and a useful bibliography.

Although published for Project Technology, this handbook's usefulness will not be confined to schools working with the Project: it should be of great value to any school or college which has an active science club or which is engaged in any form of practical work in electronics or electricity.

20. The Schools Council Project Profiles and Index

This is an annual publication of the Schools Council, giving up-to-date information on curriculum projects in Britain. The 1974/75 edition includes all projects being sponsored wholly or in part by the Schools Council as at 1 July 1974, several projects due to begin shortly and, in addition, 5 projects financed by the Nuffield Foundation which links closely with the work of certain Schools Council projects.

The Project Profiles are grouped under the broad subject headings of English, Humanities, Languages, Creative Studies, Mathematics, Science, Interrelated Studies, Special Education, Welsh, School Home and Community, School Organisation and Resources, and Examinations. The project profiles will be supplemented by the free bi-monthly bulletin "Project News", whose first issue appeared in November 1974.

The 1974/75 Project Profiles are obtainable from the Schools Council Project Information Centre, 160 Great Portland Street, London W1N 6LL and cost £1 in Britain and £1.20 overseas, including postage.

21. School Geography in the Changing Curriculum - Department of Education & Science Education Survey No 19

This report is an attempt to review the present state and status of geography in schools. During the last two decades the subject has increasingly moved in primary schools from a separate subject to one included in various forms of combined studies. Similarly its position in the secondary curriculum within environmental studies, social studies, and humanities are increasingly under review. New developments in quantitative methods, theoretical models and spatial analysis require further reorganisation of content and style of geographical teaching.

It was with these points in mind that a sample survey of geography in junior schools and classes was carried out by HM Inspectors in 1969/71 and another concerned with secondary schools in 1971/72. Their two reports have now been brought together in this document with the secondary survey forming Part 1 and the junior forming Part 2.

Part 1 briefly outlines the background to the survey and indicates the number and type of schools/classes involved. The position of geography as a separate subject in the curriculum is then examined followed by consideration of the organisational arrangements and the position of combined studies as a parallel or alternative course. Geography syllabuses are reviewed, ranging from the "traditional" regional courses to the more recent "conceptually based" courses where systematic and regional studies are chosen as examples of certain key ideas or as data from which the ideas may be produced. The report continues to outline new ideas in geography teaching, methods of enquiry and social

applications, fieldwork and its limitations, accommodation and resources for teaching, staffing and examinations. The overall conclusions reached are that geography as a school subject is undergoing a period of rapid change and reappraisal whilst geography teachers are increasingly becoming involved in various forms of experimental courses involving in general the younger or less able pupils. It still retains an important place as a subject in its own right but the specialist geography teacher of the 1970s needs to be more versatile, more open-minded about the subject and more receptive to in-service training.

At the end of Part 1 there is a most useful collection of 20 tables giving a statistical breakdown of the various factors included in the survey. These include data on the number and types of schools teaching geography as a separate subject or within various other combinations, types of syllabus, approach, fieldwork studies, and statistics on resources and staffing.

Part 2 of the report again briefly outlines the background, scope and limitations of the survey and continues to analyse the position of geography and combined studies, the importance of time allocation allotted to the subject, schemes of work and outdoor work. Resources for teaching and learning were investigated and there are several sections dealing with staff, teaching styles and records of work and children's work. The section concludes that the greater freedom in the management of time in junior schools has offered opportunities for exciting experiments in subjects such as geography. Outdoor work, the use of visual aids and the taking down of artificial barriers between traditional subjects has assisted in eliminating some of the restrictions from which geography formerly suffered. However the survey did reveal the failure of many schools to develop a satisfying and progressive programme of work and also a number of suggestions on which to base an improvement in the geographical education of juniors.

Copies of the report may be obtained from Her Majesty's Stationery Office, price 40p.

22. PUBLICATIONS

22.1 Aims, Methods and Assessment in Advanced Science Education ed D E Billing and B S Furniss (Heyden) 1973, paperback, pp 168, price £4

A welcome addition to the all too few publications about science education at the tertiary level, this book attempts to present a rational and up-to-date survey of the objectives and philosophy behind new university science courses, along with the modern educational techniques and methods of assessment now available. It was written as the result of a conference held at Thames Polytechnic, London, in December 1971 on the theme of Developments in Tertiary Chemical Education, and consists of a number of edited papers presented at that conference. Although there is a bias towards chemistry, the concepts treated are applicable to all science education.

The book is divided into 4 main sections. The first considers objectives in science education and their classification, and a number of recent new university courses are described in the second section on curriculum development. The third section, after a general discussion on instructional methods, has 3 chapters on programmed learning, computer based learning and production of television programmes respectively. The final section on assessment briefly surveys the methods available and deals with objective tests in some detail. There is also a useful appendix which lists and explains some of the educational terms now coming into common use without always being fully understood. The editors in their summary conclude that tertiary science education needs to be orientated less towards the acquisition of knowledge and more towards the development of skills and attitudes which will serve the student throughout his life.

22.2 Mathematics: Society and Curricula - H B Griffiths and A G Howson, Cambridge University Press, price £3.50

This is an important book about mathematical education which seeks to establish an intellectual framework for the subject as a discipline in its own right. This it effects against a background of historical and social factors and brings together an imposing array of both fact and interpretation. Whilst most of the content is British, and much of the remainder European, the authors' extensive knowledge of mathematical education on a world-wide scale ensures that the book could be read with profit by those in any country who are seriously involved in the teaching and learning of mathematics.

The book is divided into 7 major parts, as follows:

1. "The Problem" - considers what mathematical education is, why it should be taught, and looks at examinations and objectives.

2. "Determinants of Change: External" - looks at aspects such as pupils, teachers, funding, research and technology from an historical and developmental viewpoint.

3. "Determinants of Change: Internal" - investigates the changes within the subject itself such as the content, approaches and applications of mathematics in again an historical context.

4. "Instruments of Change" - a consideration ranging from the individual to national/international level.

5. "The Curriculum in the Large" - looks at different approaches to the teaching of mathematics using a number of very useful case studies of specific projects and finishing with an important discussion of a wide variety of philosophies.

6. "The Curriculum in the Small" - examines specific areas within mathematics such as the teaching of geometry and number systems and the position of applied mathematics.

7. "A Closer Look at Examinations" - a final consideration of evaluation.

A stimulating feature of the book is the wealth of optional "exercises" with which the reader is confronted at every few pages. There is a final useful appendix containing a large number of recent questions set by various British examining bodies.

22.3 Heinemann Experimental Chemistry Series
ed A J Mee and Martin Rogers, (Heinemann)

This is a series of 10 paperbacks designed to cover the whole area of A-Level and introductory college and university chemistry courses. The booklets vary from 40 to 80 pages in length and are prices at £0.70 to £0.80 each. In addition each book is accompanied by a somewhat shorter Teachers Guide priced at £0.80 to £1.

The topics covered are as follows:

1. Structure, equilibrium and kinetics
2. Electrochemistry
3. * Chemical analysis, chromatography and ion exchange
4. * Transition element chemistry
5. * Atomic and molecular masses
6. * Colloids
7. * Carbon chemistry
8. * The 'Periodic Table'
9. Metals and alloys
10. Radiochemistry

* yet to be published

Each book contains a number of pupil based experiments, old and new, on the topic of its title. They differ from earlier practical books at this level by not merely giving detailed instructions to be followed blindly by the student. Each experiment is preceded by a discussion, is described in sufficient detail to enable the student to carry it out, and is accompanied by questions, often open-ended, which relate to practical applications and to further development of the topic. These questions have been designed to stimulate the student to make further investigations and demand a response at a high level.

The Teachers Guides contain suggestions as to how to introduce the topic and its experiments, give details, including sources, of all apparatus and equipment required, draw attention to necessary safety precautions and give the answers and explanations to the questions.

The advantage of publishing each topic in a separate book is to be found in the flexibility it gives to the teacher, enabling him to choose only those volumes relevant to his particular course. Each book has been written by a specialist in its particular field, while the editors of the series have for many years been in the forefront of curriculum development in Scotland and England respectively.

In countries where there are no serious problems in the supply of apparatus and chemicals, these books should be warmly welcomed.

22.4 The Role of the Head Teacher - Science and Primary Education Paper No 2 published by The Association of Science Education, price 35p

This paper is one of a series intended to be made available to heads and teachers in schools and as background material for discussion in teachers' centres, colleges and departments of education and in in-service training courses. The Primary Schools Science Sub-Committee convened by Dr M Collis has recently produced this report on the role of the head teacher. The paper attempts to outline the important role to be played by any head teacher in encouraging children in primary and middle schools to work scientifically. It is not intended that this merely includes the recruitment of suitable staff but that the head should himself play an active role in involving all members of staff in planning and experimentation in new situations and approaches. The justification for scientific experience at the primary level is examined, the place of science in a balanced curriculum and suggestions offered for ways in which the non-scientific head teacher might become practically involved. A most useful list is included of activities which could form the starting points for scientific experience together with a flow-chart indicating how a number of these studies might develop continuously through to the junior and middle school levels. The report then proceeds to examine organisation with respect to working areas, access to resources, and records of progress. Communication is considered as a most important area for consideration between the head teacher and his staff and the paper concludes with prints and lists of resources for members of staff who will probably have had no specialist training in teaching science.

The pamphlet would form a most useful asset to any head teacher considering the development, expansion or improvement of science teaching in his school.

22.5 Chemical Labelling - A Report published by the Association for Science Education, price 20p

This is the third in the new ASE Study Series produced by a Sub-Committee of the Education (Coordinating) Committee which was set up to review the names encountered in schools on the labels placed on containers of chemical substances by commercial suppliers. The aim was to investigate any discrepancies between the names used and those recommended by the Association's report "Chemical nomenclature, symbols and terminology" which studied the feasibility of a scheme to print labels bearing recommended names. This initial intention has now been expanded to include an attempt to design labels on which the nomenclature is as recommended in the Report and in addition, to include information about precautions to be taken during use and immediate first aid action in an emergency.

This paper is mainly an attempt by the Committee to outline its recommendations in this extremely important area and to gather ideas from members and other interested persons. A number of interesting and useful ideas are outlined together with appendices of books and other information relating to safety and hazards. A final appendix lists those chemicals which the Sub-Committee regard as hazardous that have the highest unit sales.

22.6 Mathematics Eleven to Sixteen - Mathematical Association Report. Published Bell, price £1.85

"Mathematics is a way of looking at the world". This quotation gives the flavour of this recent report of the Mathematics Association on the state of the art of mathematics teaching in the main secondary school course in Britain. It is, however, the view that is seen by the more gifted sector of the secondary school population. The report was prepared by members of the Teaching Committee of the Association, among them teachers of very wide experience and international eminence. As one would expect in a report from the Association, the theme is analysed from the standpoint of the subject, rather than, for example, from a consideration of the various social and motivational problems that face many teachers in schools which cater for the whole ability range. Consequently the report will be of greatest value to secondary teachers whose pupils will take a public examination of the School Certificate or GCE O-Level type - and to those who are responsible for preparing textbooks and other teaching materials for them. Within this limitation, the report is excellent. It describes the mathematical basis for the changes that are taking place in syllabuses, and it shows the superficial nature of the commonly-asked question "Traditional or Modern?" Practical teaching suggestions are scattered liberally throughout the report. Many readers will particularly value the chapter on "Assessing Progress" in view of the current world-wide debate on methods of evaluation.

22.7 New Trends in the Utilisation of Educational Technology for Science Education, UNESCO

This is the title of a publication recently issued by UNESCO, Place de Fontenoy, 75700 Paris, representing the proceedings of a Symposium held in September 1972 under the sponsorship of UNESCO and the International Council of Scientific Unions (ICSU) Committee on the Teaching of Science.

The Symposium explored current trends in the utilisation of educational technology to improve the teaching and learning of science at all levels. The Symposium was preceded by a survey of the literature to determine the most significant developments. A series of papers was then commissioned on 8 main themes - computer-based science education, programmed learning in science education, use of television in science teaching, use of radio in science education, learning media, integrated multi-media, educational technology in the professional training of science teachers and educational technology applied to the learning of science in developing countries. The authors of these papers together with other specialists in educational technology and representatives of UNESCO and ICSU were the principal participants in the Symposium. As a result of the discussions during the Symposium the authors revised their papers and the revised papers constitute the present UNESCO publication. The book is introduced by an article, written in non-specialised language, describing the highlights of the Symposium and the spirit in which the discussions took place.

The publication is directed to all those who have an interest in or responsibility for improving science education through the use of more effective methods of teaching and learning.

22.8 School Technology in Action, ed A Marshall. English Universities Press in association with The Open University Press, price £2.25

This book has been prepared as essential reading for a new post-experience course for teachers of technology which is being offered by the Open

University for the first time this autumn. It consists of a collection of articles taken from publications associated with the Schools Council Project Technology but these have been skilfully edited so as to form a coherent account of school technology at the present time in Britain.

It opens with a brief attempt to define the objectives behind the introduction of School Technology and an historical account of Project Technology since its inception in 1967. A second somewhat longer section brings together a number of articles which illustrate the different interpretations of the place and function of technology in the school curriculum. A third and major section describes in detail various teaching projects actually carried out in school, while a fourth indicates some of the resources available to support the teaching of technology.

It is useful to have a survey of what has taken place in school technology in this form. The last British publication of similar scope was "A School Approach to Technology" published in 1967 by HMSO. In the intervening 7 years tentative moves have been transformed into a more clearly shaped educational activity to which increasing attention is being paid.

OVERSEAS ACTIVITIES

23. GERMANY

'IPN' - University of Kiel

Institut für die Pädagogik der Naturwissenschaften, 'IPN', at the University of Kiel is a National Research Institute, whose task is research, through multi-disciplinary approaches, in the field of science education. The IPN carries on this research from the psychological and social aspects, develops science curriculum materials, and evaluates their effects in schools.

The work of the IPN is further concerned with basic studies in the syllabi of different areas of the Federal Republic of Germany, advice on school experiments, basic research on school books, documentation of curriculum systems, teacher training, preparation of general educational and school oriented decision making aids and the organisation of seminars and symposium. The IPN offers courses required for qualification as university lecturer in science education. It maintains contact with foreign science teaching research institutes and thereby plays a go-between role in the research of science curricula. Likewise it operates an exchange with inter-governmental organisations such as UNESCO, OECD, the Council of Europe.

The budget of the IPN is divided into the regular budget and into the programme budget for special research plans. In 1974 each of these budgets supported about 50 members of staff. The regular budget for 1974 is DM 2.1 millions and the programme budget is DM 2.66 millions. The total budget thus reaches DM 4.76 millions.

The IPN is affiliated to the University of Kiel. The body responsible for it is the "Stiftung für die Pädagogik der Naturwissenschaften". Between 40 and 50 scientists, educationists, science educators and psychologists work at the Institute and are mostly drawn from the universities and schools in Germany. About the same number of posts are occupied by technical staff and administrative and secretarial personnel. There are also teachers who work in the institute in study groups for limited periods. They are practising teachers and they participate in various curriculum projects at the same time.

The IPN is divided organisationally into departments concerned with biology education, chemistry education, physics education, educational and psychological methodology, educational sciences and administration and general services. The work is divided among project groups which leads to a project oriented inter-disciplinary cooperative effort between members of different departments. Current research areas at IPN include curricula in physics, chemistry and biology at various levels together with more general research in the cognitive and affective domains and other general areas.

The mailing address of IPN is: Institut für die Pädagogik der Naturwissenschaften, Olshausenstr 60-60, D2300 Kiel 1, West Germany.

24. NIGERIA

The following note appeared in the Science Teachers Association of Nigeria Journal Vol 12, No 4:

Lagos Ministry of Education Primary Science Programme

The Lagos State Primary Science syllabus was launched in 1970 and it was adopted in all Primary Schools in the State in 1971. The syllabus will be in its fifth year of operation when Schools resume for the 1974/75 Session.

The main aim of the Syllabus is to lead children, by various means, to explore the world around them so that they can understand and appreciate the forces which daily affect their lives. In pursuance of this objective, the Syllabus encourages the 'playway' and inductive approaches to teaching.

Facilities for Science teaching in the Schools have improved steadily since the introduction of the syllabus. Most of the Schools in the Lagos Division have Special Science Rooms some of which are notably well organised and equipped. The Ministry gives regular grants for the provision of Science equipment among other items.

Prior to, and since the introduction of the syllabus, the Ministry organises annual induction Courses for teachers. Information Sheets on such Courses include suggested activities and Schemes which are circulated among participants. A new three-month intensive primary mathematics and science course is run for batches of 100 teachers each term at the Advanced Teachers' College, Surulere. As an incentive to teachers, success in the 'M & S' Course is rewarded with incremental credits.

One of the drawbacks to further improvement of Science teaching in Primary Schools in the State is the lack of specific texts and other materials to teach the syllabus.

In its efforts to promote the production of adequate materials, the Ministry will, in the next School year, trial-run a book of activities written by a Science teacher in one of the Grade II Colleges in the state.

25. SINGAPORE

The Colombo Plan Staff College for Technician Education has recently been established in Singapore to serve the South and South East Asian region. The rationale for the establishment of this college rested on two basic premises:

a. that the countries of the region wish to expand and to improve the quality of their systems of technician education;

b. that, in these countries, there is an urgent need to increase the supply of well trained technician teachers and to improve the quality of the teaching of those already in service.

It is recognised that in the long run the countries themselves may well solve their own problems but meanwhile it is hoped that the Staff College can greatly assist by:

i. providing courses of further professional education and training both at the college and in regional member countries;

ii. to conduct study conferences at which problems of technician teacher education and training may be discussed and examined;

iii. to assist regional countries and institutions to undertake projects in the field of staff and curriculum development and projects aimed at the effective utilisation of resources for learning and teaching;

iv. to promote, coordinate and undertake research into the special problems of technician teacher education and training;

v. to advise and assist member countries in developing their technician teacher education and training facilities;

vi. to collect and disseminate information on technician education and training and technician teacher education and training.

26. Chemical Education in Europe - New Project

Chemical Education in Europe is a newly established project whose aim is to gather and collate information about the methods and ideas governing the education of chemists in Europe and to study their relevance to the needs of society. The study will concern itself mainly but not exclusively with university level education and will encompass all European countries, including the USSR.

Project Chemical Education in Europe is jointly funded by the Chemical Society, the Royal Society and Unesco. During the first year of the project, which began in the summer of 1974, there will be two closely related activities:

i. The preparation of a book to survey tertiary level chemical education in Europe. This will be in two sections, of which the smaller will contain factual information about institutions, courses and qualifications. It is intended to consolidate information (mainly in tabular form) into a single publication to be used by European chemists. The second section will consist of a series of commissioned papers making comparisons of chemical education between two or more countries. Authors will be asked to write about trends and innovations in the education and training of chemists with particular reference to how these affect students, teachers, employers and the general public. The editor of the book will be Dr P J Farago, a managing editor of the Chemical Society and editor of "Chemistry in Britain".

ii. Complementary to the preparation of this volume, a network of organisations, institutions and individuals will be established who are concerned with the improvement of chemical education at school and university or equivalent levels.

The overall director of the project is Professor M J Frazer of the University of East Anglia and progress with establishing the network and contributions to the book will be discussed at a European Seminar on Chemical Education which will be held in Madrid in September 1975 by the Federation of European Chemical Societies.

Further details of the project may be obtained from Professor Frazer at the Chemical Education Sector, School of Chemical Sciences, University of East Anglia, Norwich, NOR 88C, Norfolk, UK.

27. British Council Course 422: Processes of Science Curriculum Development

This British Council course was held from 26 August to 21 September in Dundee and Nottingham. Twenty-one senior science educators from 15 countries took part.

The aims of the course were to enable members to acquire:

1. A deeper understanding of the reasons for introducing curriculum changes and of the factors which can both affect and effect them;

2. a fuller appreciation of the need for and methods of evaluation and assessment;

3. a greater ability to plan curriculum change, and

4. some knowledge and understanding of the English and Scottish solutions to the problems encountered in recent curriculum innovation and development.

The first two weeks were based at the Dundee College of Education under the directorship of Mr J A R Hughes, Director of the Scottish Centre for Mathematics, Science and Technical Education. After an introduction to current science education in Scotland and the reasons for and the methods of changing the curriculum, participants went on to study the development of the integrated science course and of separate subject courses at Higher Grade and for Six-Form Studies. In each case one of the directors of the project concerned came to address the course. Current research activities in science education at some of the universities and cultures of education were also discussed. In addition, there were sessions on teacher education, science advisers, examinations, the design of modern school laboratories, and science education for handicapped children. On one brief occasion participants described new projects being developed in their own countries. Visits were paid to 4 secondary schools and to the Scottish Schools Science Equipment Research Centre in Edinburgh.

In the second half of the course, which was based in the University of Nottingham School of Education under the direction of Professor J F Eggleston, the emphasis was more on visits to schools. Groups of participants visited a primary and a secondary school in Leicestershire both on two separate occasions to make a study of the curriculum there with special emphasis on science, and the possibilities and constraints for bringing about changes. These surveys were carried out with the help and cooperation of the principals and science teachers concerned and results and conclusions were discussed in plenary sessions after the visits. In addition, after a historical introduction to English education, there were lectures given on various aspects of curriculum development and subjects related to it such as heurism, examinations, teacher training, evaluation and diffusion.

28. Commonwealth Association of Science and Mathematics Educators

The above Association was founded at a meeting held in London from 10-14 October at Marlborough House, headquarters of the Commonwealth Secretariat in London. The objectives of CASME are as follows:

1. To foster links between those concerned with education in science, technology and mathematics with special reference to the social significance of these subjects and their relationship to community education.

2. To exchange views among members engaged in the process of integrating studies of science and mathematics into existing cultures, customs and developing technology of a country.

3. To provide a clearing house for the assembly and dissemination of knowledge of schemes related to the objectives of the Association.

Those interested in obtaining further information about CASME should write to the Honorary Secretary, CASME, Commonwealth Secretariat, Marlborough House, Pall Mall, London SW1.

29. ICMI Symposium at Vancouver (Canada) 22-24 August 1974

Theme: Evaluation of Modern Mathematics Curricula

The symposium was devoted primarily to a discussion of the methods available for evaluation of new curricula, although some tentative results of the application of some of these methods of evaluation were also noted. The first 2 days were devoted to presentations on the theme from 11 countries: Canada (the host country), USA, Brazil, India, Japan, USSR, Poland, Hungary, Germany, Denmark and UK. The last day was concerned with discussion and summarisation.

In Canada, education is the responsibility of each separate province. Ontario adopted modern mathematics curricula around 1964 and abolished external examinations in 1967. With 80% of children staying in school to age 18 and having a free choice of courses (on a course credit system) a natural evaluation method is based on observing the proportions opting for mathematics courses; these indicate that the subject is more than holding its own. In another province (Saskatchewan), coming much later to modern mathematics, evaluation through questionnaires to teachers had been tried but the response rate was much too low. British Columbia used an evaluation based on the Stanford arithmetic reasoning and computation test, with indications that a forwardness of over a year relative to the average US student had been lost during the 6 years after modern mathematics curricula had been introduced. Quebec, after using much material of French origin, reported somewhat similar results.

Several US evaluation studies on a large scale were briefly described. A widespread belief that acquisition both of cognitive skills and of attitudes in mathematics depends on the individual teacher much more than on any other variable was supported by massive statistics, which showed also that this variable 'teacher quality' is not well correlated with any objective data about the teacher's training or knowledge! The importance of textbooks is supported by a very close observed relationship of what is acquired to 'what is in the textbooks' rather than to any other material that may have been presented. No significant support for special aids (film, TV, maths laboratories, team teaching) had emerged from the evaluations. Modern mathematics with emphasis on discovery methods appeared to have made young people in the USA better able to think and less able to compute.

The idea of evaluation by 'determining which books sell' was suggested by Brazilian experience where sales of abstractly oriented material were stated to have plummeted 2 years ago in response to a general disillusionment with such material coupled with a growing belief that a developing country needs a particularly practical approach to mathematics teaching, integrated as far as possible with science teaching. The rapid introduction of profession-oriented secondary schools had been tending to accelerate this process.

India has for a long time been introducing in selected groups of schools curricula that are 'modern' both in method and content while at the same time emphasising practical applications. Comparative studies demonstrate greater alertness and penetration in the pupils of these selected schools relative to the schools not selected for these changes, although admittedly several psychological (rather than curriculum) factors could contribute to such a difference.

Japan is another country where 80% of the age group now reaches 'senior high school' (immediate pre-university level). Under the wise influence of Professor Iyanaga and others a subtle middle course between 'traditional' and 'modern' curricula has been followed. This course has, however, been introduced simultaneously with the huge expansion of secondary education and the inevitable lowering of standards that has gone with that, and evaluation of the effects of the two developments is proving exceedingly hard to disentangle.

The USSR is another country deeply concerned with evaluating its material from the point of view of practical skills as well as of theoretical understanding. A new commission under the chairmanship of Academician Kolmogorov has recently begun a major new evaluation exercise.

Polish experience has confirmed the view that significant changes in teaching methods can only be achieved along with changes in curriculum contact. Opinion surveys of teachers and pupils show that it is such new classroom methods which

are widely preferred and regarded as important. In Poland, also, evaluation of training for primary school teachers has shown the great superiority of methods which take the student through the subject matter along the same routes as the pupils will follow (preceding introduction of concepts and formalism by extensive concrete exercises, etc) to break down the diffidence that may have been generated by inferior mathematics teaching in a student's own early years.

A modern system of primary teaching of mathematics was introduced a decade ago in a sample of Hungarian schools. Now the children in these schools are significantly better than others even when tested in traditional mathematics, or in reading and writing! It is again important to remember, however, the non-curriculum factors operating where selected schools and teachers are involved. Experience in the Federal Republic of Germany, in fact, showed improvements in attainments when a new mathematics curriculum was introduced in a selection of primary schools, followed much later by an observed loss in average attainment after the same curriculum had been introduced in all primary schools.

Germany is, of course, another country facing an enormous expansion of secondary education. Developments planned to deal with this include the concept of a Grundkurs (oriented more practically) for about 90% of the pupils and a Leistungskurs in greater depth (and oriented more theoretically) for about 10%.

Denmark in its approach to evaluation emphasises 'affective' goals (attitudes etc) and aims at a strong interaction between teacher and student which is relied upon as the prime method of student evaluation. The modern curricula introduced in 1964 were revised in detail in 1971 after a thorough evaluation leading to a recognition of the need for a reduction in content to give more time for concept formation built up in depth from detailed work making use of the child's immediate experience and environment.

The UK contrasted four different approaches to evaluation, whether of whole projects or of texts and other materials. Emphasis was placed on the essential need for 'formative' evaluation: the experimental process of extended classroom trial of materials while they are being generated and finalised. By contrast, 'experimental' evaluation where certain schools are selected for use of new curricula and methods, and then compared with a 'control' group of other schools, was regarded with suspicion because of bias by the morale-boosting effect of being selected and trained to use new material. 'Summative' methods using masses of statistical data face two dangers: either the samples are not large enough to give statistical significance where so many variables are involved (including the 'teacher quality' variable which can so easily swamp the others) or the samples are so vast that it is impossible to maintain proper standards of accuracy and reliability in the collection of raw data. These dilemmas have led to greater emphasis on a 'clinical' or 'anthropological' approach to evaluation where classrooms are selected as randomly as possible and the investigator, behaving almost like an unnoticed 'fly on the wall', tries to observe in as much depth and detail as possible all aspects of the transfer of attitudes, knowledge and skills taking place and its dependence on the materials used.

Evidently, many obstacles to the objective evaluation of modern mathematics curricula still exist. The massive raising of the school leaving age all over the world is not the least of these. High-powered salesmanship by purveyors of materials is another! As to the results of the evaluations that have taken place, they can in most respects be regarded at present as inconclusive. Nevertheless, in the context of an international symposium it is of interest to note that almost complete unanimity was expressed on one subject: the general ineffectiveness of imported materials, except where they have been subjected to a lengthy and detailed process of modification and adaptation to the general environment of children in the country where they are to be used.

In the concluding discussion, methods of evaluation of students' attitudes, knowledge and skills were subjected to particularly detailed scrutiny because such evaluation often forms one necessary stepping-stone towards an objective evaluation of materials (that is, curriculum projects, classroom texts and educational aids). Among the most important goals of modern mathematics curricula are the improvement of student attitudes to the ideas of mathematics and to what the student can do with them. Evaluations had, indeed, suggested some very positive achievements in this sphere by modern mathematics curricula. These were not always maintained at age 14-15, however, where indeed a certain statistical deterioration in attitudes to school work was common to all subjects of study. Furthermore, attitudes regarding some particular goals of mathematical work, such as accuracy, had not necessarily been improved.

The right level of 'drill and practice' work, for acquisition of skills of mathematical manipulation in elementary algebra and arithmetic, was the subject of extended discussion. There was widespread agreement that excessive drill and practice in traditional mathematics teaching had had a seriously adverse effect on attitudes to mathematics, as well as incurring the danger of teaching skill without any understanding. The pendulum might however have swung too far in the other direction in many modern mathematics curricula: understanding without any skill was an equally unbalanced goal. A partial retracing of steps towards some intermediate level of drill and practice would produce a better balance between attitudes and understanding on the one hand and knowledge and skills on the other.

The important interactions between mathematics teaching and science teaching were much stressed in this context. Science teaching was held to be greatly facilitated by a reasonable level of manipulative skill in elementary algebra as well as arithmetic. Future developments of 'hand calculators' may offer partial substitutes for students' detailed arithmetic skills but not for their skills in algebraic manipulation.

Lastly, strong emphasis was placed on teacher training as an essential pre-requisite for effective mathematical education, particularly where new methods and curricula are introduced; these, indeed, render in-service training just as important as pre-service training. Without it there is a grave danger that new material is simply taught by old methods, although the new methods are widely regarded as more important than the new material. Again, loss of effectiveness in a proportion of teachers who feel insecure or 'threatened' by the introduction of new methods or curricula can be minimised by proper training measures. The aim was summed up by one speaker as the training of teachers skilled equally in facilitating the acquisition of a satisfactory general level of mathematical attainments (affective and cognitive) by a majority of pupils, and in helping a modest proportion of pupils to reach high levels of attainment.

Extensive additional work on methods of evaluation of modern mathematics curricula and on the analysis of their results is evidently needed. It is hoped, in particular, that important further steps in this direction may be taken at the 3rd International Congress of Mathematical Education in 1976.

30. IMU General Assembly, 1974

The General Assembly of the International Mathematical Union was held in August 1974 at Harrison Hot Springs, near Vancouver, Canada. At the General Assembly, elections to ICMI took place as follows:

Professor S Iyanaga of Japan, at present Vice President of ICMI, was elected to be President of ICMI for the period 1975-78. Professor Iyanaga has appointed Professor Y Kawada of Japan as Secretary of ICMI for the same period. He has also appointed Professor B Christiansen of Denmark and Professor H G Steiner of the Federal Republic of Germany as Vice Presidents.

Members-at-large of ICMI were elected as follows: Begle (USA), Bhatnagar (India), Castelnuovo (Italy), Christiansen (Denmark), Iyanaga (Japan), Kudryatsev (USSR), Lelong (France), Neumann (Australia), Semadeni (Poland) and Suranyi (Hungary). Members ex officio are the retiring President of ICMI, the Secretary of IMU and the representative of IMU on the ICSU Committee on Science Education. There is no change in the remaining members - that is, the national representatives - except that Professor Iyanaga has been replaced by Professor Kawada as national representative of Japan.

31. The Nairobi Symposium on 'Interactions between Linguistics and Mathematical Education', 1-11 September 1974

This Symposium was originally envisaged by ICMI at its Exeter Congress in 1972 and was subsequently prepared and convened under the joint sponsorship of UNESCO, CEDO and ICMI.

The Symposium brought together 28 specialists, each serving in his personal capacity. Out of this group, 15 specialists were nationals of 9 African countries - Ghana, Kenya, Lesotho, Liberia, Nigeria, Swaziland, Tanzania, Uganda and Zambia. All participants were specialists in at least one of the two fields, mathematics education and linguistics, and in several cases participants also had special knowledge in science education.

The work of the Symposium took place in plenary sessions and working groups during 9 working days. In the first plenary session, following the inauguration, presentations covering the background and the objectives were given by Professor Sir James Lighthill and Professor Bent Christiansen. The 3 main objectives were:

1. To contribute to the systematization within the field of these difficulties in mathematical education which pertain to linguistics, and further to analyse these difficulties and their mutual relationships.

2. To identify problems calling for further studies and research, and to indicate how and by whom such activities might be put in hand.

3. To identify pedagogical approaches that may help the learner of mathematics to overcome those of his difficulties which relate to linguistic aspects and to indicate how such approaches might be put into practice.

In the plenary sessions of the earlier working days background papers, provided for the participants in advance of the Symposium, were presented and each speaker aimed in his brief presentation at highlighting such aspects of his paper which he found most relevant on the background of the preceding work of the Symposium. Discussions in plenum and/or in working groups followed each presentation. Towards the end of the Symposium a number of brief re-formulations were written by authors of the invited papers. These re-formulations will be included in the report of the Symposium which is expected early in 1975. It describes the origin, purpose and scope of the Symposium, and outlines its progress identifying the background of the presentations and the discussions. The report finally outlines the findings of the Symposium, and gives a summary of its many recommendations which are concerned both with future studies and research and with more immediate pedagogical implications.

Information on the report can be obtained from UNESCO, Paris.

32. Report on the ICMI-IDM Symposium on the Teaching of Geometry, Bielefeld, 16-20 September 1974

ICMI and the Institute for Didactics of Mathematics of the University of Bielefeld, FRG jointly organised a conference on the teaching of geometry which was held at the Center for Interdisciplinary Research of Bielefeld University. The prior information about this conference had been channelled through ICMI Bulletin No 3 and through various national and international journals.

This conference was attended by 110 mathematicians and mathematics educators from 13 different countries (Czechoslovakia, Belgium, FRG, France, GB, Ireland, Japan, Luxembourg, The Netherlands, Poland, Sweden, Uruguay, USA). The programme contained the following lectures:

H J Vollrath, Würzburg: The place of Geometry in the Teaching of Mathematics. An Analysis of Recent Developments.

W Servais, Morlanwelz: A Comprehensive and Modern Teaching of Geometry.

R Stowasser, Bielefeld: Problemorientierte Zugänge zur Geometrie.

G Pichert, Giessen: Die Bedeutung der Darstellenden Geometrie für die Mathematikausbildung.

H Freudenthal, Utrecht: Geometry in the Primary School.

A Bishop, Cambridge: Visual Mathematics.

S Iyanaga, Tokyo: A Combined Geometry - Algebra Curriculum for Japanese Secondary Schools.

G Ewaldy, Bochum: und Axiomatik, dargestellt an einer Begründung der absoluten Geometrie.

T Fletcher, Darlington: Geometrical Insight and Solution of Problems.

G Glaeser, Strasbourg: Inzidenzgeometrie im Dienste einer Progressiven und polykonkreten Pädagogik.

Related to each lecture were discussions in working groups and a plenary discussion. Some of the basic matters of concern in the discussions were the following: What is geometry and how should it be approached and organised in the teaching of mathematics at the various levels? What role should problem solving, local ordering and axiomatics play in this organisation? What background should a teacher have in order to be well prepared for geometry teaching? Can one identify a minimum of knowledge and insight concerning geometry a student should have when leaving secondary school?

The conference proceedings are being edited by and will be available from the Institute for the Didactics of Mathematics, University of Bielefeld, D4801 Jöllenbeck, Heidsiekerhedie 94, West Germany.

33. ICME-JSME Regional Conference in Tokyo (Japan) 5-9 November 1974

The theme of this conference was: "Curriculum and Teacher Training for Mathematical Education".

The Organising Committee under the Chairmanship of Professor Z Kobayashi arranged a programme for the 150 participants as follows:-

Lectures at Plenary Sessions

Professor M H Stone: 'Teaching of Mathematics, Some Questions, Some Answers'.

Dr A G Howson: 'Some Experience of Curriculum Development in England'.

Academician S L Sobolev: 'The Experience of Siberian Mathematical Olympiads 1962-73'.

Professor B H Neumann: 'Teaching Teachers of Teachers'.

Professor A Lichnerowicz: 'But et difficultés de l'expérience français de renouvellement de l'enseignement mathématique'.

Mr J Vanniasingham: 'Modern Mathematics Program and In-service Training'.

Professor H G Steiner: 'Modern elementary algebra as a significant component in a contemporary secondary school mathematics curriculum'.

Professor Y Akizuki: 'How to educate the spirit of mathematics'.

Working Groups for Papers and Discussions were held on the following topics:

A: Mathematics in Primary School
B: Mathematics in Secondary School
C: Preparing Teachers of Mathematics in Training Institutions
D: In-service Training
E: Educational Technology in Mathematical Education

and visits to a variety of Institutions were arranged.

Professors Iyanaga (Japan) and Neumann (Australia) acted as co-chairmen of the Regional Conference.

34. Forthcoming International Conferences

34.1 17th London International Youth Science Fortnight

The 17th London International Youth Science Fortnight will take place in London from 30 July to 13 August 1975. The Fortnight is organised by the Council for International Contact which is an independent organisation whose aim is the promotion of international understanding through the meeting of people from all nations. More than 400 students normally attend of whom half come from Britain and half from countries from all over the world.

The academic level is that of university entrance and participants should be in the age range 17-22 years and have a good working knowledge of English. Accommodation is arranged in halls of residence of London University and the programme includes lectures by eminent scientists, discussion groups, visits to industrial and research establishments, university departments and museums.

Further information may be obtained from The Council for International Contact, 308 Earl's Court Road, London SW5 9BD, England.

34.2 ICMI Symposium at Warsaw (Poland) 25-28 August 1975

Theme: Combinatorics and Probability in Primary Schools.

The Symposium is sponsored jointly by ICMI and by the Polish Ministry of Education. The subject matter includes combinatoric aspects of the teaching of various topics including sets, arithmetic, geometry and an introduction to statistics. Further information may be obtained from Professor Z Semadeni, Institute of Mathematics, Polish Academy of Sciences, ul. Sniadeckich 8, 00-950 Warszawa, Poland.

34.3 2nd World Conference on Computer Education

This Conference, organised by IFIP (International Federation of Information Processing) with the co-sponsorship of ICMI, is being held at Marseille, France from 1-5 September 1975. The Chairman of the Programme Committee is Dr J Hebenstreit, École Supérieure d'Électricité, 10 Avenue Pierre-Larousse, 92-Malakoff, Paris.

34.4 Educational Technology in the Teaching of Chemistry

This is the title of a Symposium to be held in Madrid on 6/7 September 1975 during the occasion of the Biennial Conference of the International Union of Pure and Applied Chemistry.

The Symposium will review trends in the use of educational technology in the teaching of chemistry at secondary and tertiary levels and will attempt to evaluate the use of educational techniques. In addition to papers concerned with specific aspects of educational technology such as programme learning, individual instruction, multi-media techniques, television, radio, computer-assisted instruction and other visual aids, there will be composite contributions from individual countries or regions and papers on the use of educational technology in developing countries. The coordinator of the Symposium will be Professor C N R Rao, Chairman, IUPAC Committee on the Teaching of Chemistry.

Further details about the Symposium can be obtained from the IUPAC Secretariat, 2/3 Pound Way, Cowley Centre, Oxford.

34.5 Regional Conference to be held in India during one week in December 1975

Theme: Integrated Mathematics Curriculum Development for Developing Countries.

The Conference is being sponsored by ICMI jointly with the Indian National Science Academy, University Grants Committee and National Council for Educational Research and Technology. Participation is being invited from all the developing countries of South Asia.

The objectives of the Conference are to collect information about the state of mathematical education in various countries of the region, and about their needs and goals and their efforts in the field of curriculum development; and to examine the possibility of formulating an integrated curriculum in mathematics at secondary and undergraduate levels which is relevant for the attainment of the goals of those countries.

Further information may be obtained from the Executive Secretary, Indian National Science Academy, Bahadur Shah Zafar Marg, New Delhi-1, India.

34.6 3rd International Congress on Mathematical Education to be held at Karlsruhe (Federal Republic of Germany) 16-21 August 1976

The planning of this third major Congress under the auspices of ICMI continues most actively. Information may be obtained (as it becomes available) from Professor H Kunle, Mathematisches Institut II, 75 Karlsruhe, Kaiserstrasse 12, Federal Republic of Germany.